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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/532,922	03/22/2000	Bruce Emerson Wilcox	8993/108	8556

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EXAMINER	
LEI, TSULEUN R	
ART UNIT	**PAPER NUMBER**
2684	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/532,922	Applicant(s) WILCOX ET AL.	
	Examiner T. Richard Lei	Art Unit 2684	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on ______ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-38* is/are pending in the application.

4a) Of the above claim(s) ______ is/are withdrawn from consideration.

5)☐ Claim(s) ______ is/are allowed.

6)☒ Claim(s) *1-38* is/are rejected.

7)☐ Claim(s) ______ is/are objected to.

8)☐ Claim(s) ______ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on ______ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on ______ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. ______ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5 .

4) ☐ Interview Summary (PTO-413) Paper No(s). ______ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claim 1-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Johnston et al. (U.S. Patent 5,784,032) in view of Monma et al. (U.S. Patent 6,211,830 B1).

Regarding Claim 1, Johnston teaches a multiple antenna system (Johnston, Fig. 29B), comprising: (a) first and second antennas (Johnston, Col.3, Lines 22 & 25);(b) first and second signal circuits connected with respective first and second antennas via first and second signal paths (Johnston, Col.3, Lines 33-34);(c) a first parallel tuning circuit (Johnston, Col.10, Lines 35-37) connected in parallel with the first signal path, the first tuning circuit adjusting the impedance of the

first antenna (Johnston, Col.11, Lines 5-7). Johnston does not teach that the first parallel tuning circuit is selectively connectable with the signal path, and that the first tuning circuit is selectively adjusting the impedance of the first antenna. Monma, however, teaches such arrangement of antenna tuning circuits (Monma, Figs.8-12) and the methods of selectively adjusting the impedance of the antenna (Figs. 10-11). Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to add the multiple tuning circuits of Monma to the multiple antenna system of Johnston to make his system capable of operational in multiple frequency bands.

Regarding Claim 2, Johnston as modified by Monma teaches the multiple antenna system of claim 1 further comprising a third antenna connected with a third signal source via a third signal path (Johnston, Col.3, Lines 2; Fig.29A).

Regarding Claim 3, Johnston as modified by Monma teaches the multiple antenna system of claim 1, wherein the first and second signal circuits are capable of generating electromagnetic signals (Johnston, Fig.29A, transceiver).

Regarding Claim 4, Johnston as modified by Monma teaches the multiple antenna system of claim 3, wherein the electromagnetic

signals include radio frequency signals (Johnston, Fig.29A, transceiver; Col.5, Lines 48-50, cellular phone).

Regarding Claim 5, Johnston as modified by Monma teaches the multiple antenna system of claim 1, wherein the first and second signal circuits generate signals at unique frequencies (Johnston, Col.6, Lines 57-60, separate receiver for different unique frequencies).

Regarding Claim 6, Johnston as modified by Monma teaches the multiple antenna system of claim 1, wherein the first and second signal circuits generate signals at the same frequencies (Johnston, Col.4, Line 34, Splitter is used to split the same frequency signal.).

Regarding Claim 7, Johnston as modified by Monma teaches the multiple antenna system of claim 1, wherein the first and second antennas are fabricated on a common dielectric material (Johnston, Col.10, Lines 53-62; Figs.21 & 22).

Regarding Claim 8, Johnston as modified by Monma teaches the multiple antenna system of claim 1, further comprising an antenna housing capable of housing at least the first and second antennas (Johnston, Col.3, Lines 43-47).

Regarding Claim 9, Johnston as modified by Monma teaches the multiple antenna system of claim 1, wherein the second signal circuit is capable of generating signals in. multiple frequency bands (Johnston, Fig.29A, transceiver).

Regarding Claim 10, Johnston as modified by Monma teaches the multiple antenna system of claim 9, wherein the first parallel tuning circuit is capable of increasing isolation (Johnston, Col.4, Lines 7-11, tuning out the reactance; Johnston, Col.6, Lines 55-57, good isolation) between the first and second antennas in multiple frequency bands.

Regarding Claim 11, Johnston as modified by Monma teaches the multiple antenna system of claim 1, wherein the first parallel tuning circuit includes an impedance matching circuit (Johnston, Fig.29B, tuning/matching).

Regarding Claim 12, Johnston as modified by Monma teaches the multiple antenna system of claim 11, wherein the impedance matching circuit is capable of matching an impedance of the second antenna via electromagnetic coupling with the first antenna (Johnston, Col.4, Lines 7-11, tuning out the reactance).

Regarding Claim 13, Johnston as modified by Monma teaches the multiple antenna system of claim 11, wherein the impedance matching circuit is capable of matching an impedance of the

second antenna (Johnston, Col.4, Lines 7-11, tuning out the reactance).

Regarding Claim 14, Johnston as modified by Monma teaches the multiple antenna system of claim 11, wherein the first tuning circuit includes a plurality of impedance matching circuits, each impedance matching circuit being independently selectively connectable in parallel to the first signal path (Monma, Figs.8-12).

Regarding Claim 15, Johnston as modified by Monma teaches the multiple antenna system of claim 1 further comprising: (d) a second parallel tuning circuit selectively connectable to the second signal path (Johnston, Col.3, Lines 33-34).

Regarding Claim 16, Johnston as modified by Monma teaches the multiple antenna system of claim 15, wherein the second parallel tuning circuit is capable of optimizing isolation (Johnston, Col.4, Lines 7-11, tuning out the reactance; Johnston, Col.6, Lines 55-57, good isolation) between the first and second antenna.

Regarding Claim 17, Johnston as modified by Monma teaches the multiple antenna system of claim 1, wherein the first tuning circuit is selectively connectable to the first signal path near the first antenna (Monma, Figs.8-12).

Regarding Claim 18, Johnston as modified by Monma teaches the multiple antenna system of claim 1, wherein the first tuning circuit creates an impedance at an input of the first antenna substantially equivalent to an open circuit at the transmission frequency of the second antenna (Johnston, Col.4, Lines 7-11, tuning out the reactance; Johnston, Col.6, Lines 55-57, good isolation).

Regarding Claim 19, Johnston as modified by Monma teaches the multiple antenna system of claim 1, wherein the first parallel tuning circuit includes a plurality of band tuning circuits, each band tuning circuit being independently selectively connectable with the first signal path (Monma, Figs.8-12).

Regarding Claim 20, Johnston as modified by Monma teaches the multiple antenna system of claim 19, wherein each band tuning circuit creates a different impedance at an input to the first antenna (Monma, Figs.8-12).

Regarding Claim 21, Johnston as modified by Monma teaches the multiple antenna system of claim 19, wherein the first tuning circuit includes a first band tuning circuit capable of tuning the second antenna and a second band tuning circuit capable of

tuning a third antenna (Johnston, Col.13, Lines 32-34, first, second and third antenna are electrically isolated).

Regarding Claim 22, Johnston as modified by Monma teaches the multiple antenna system of claim 19, wherein the first parallel tuning circuit is capable of dynamically adjusting the impedance (Monma, Figs.10-11).

Regarding Claim 23, Johnston as modified by Monma teaches the multiple antenna system of claim 19, further comprising a detector capable of dynamically connecting one or more of the plurality of band tuning circuits with the first signal path (Monma, Fig.3, No.242, detecting unit).

Regarding Claim 24, Johnston as modified by Monma teaches the multiple antenna system of claim 1, wherein the first signal source includes a radio transceiver (Johnston, Fig.29B).

Regarding Claim 25, Johnston as modified by Monma teaches the multiple antenna system of claim 1, wherein the multiple antenna system is adaptable for use in a cellular telephone (Johnston, Col.5, Line 49).

Regarding Claim 26, Johnston as modified by Monma teaches a parallel tuning circuit for use in a multiple antenna system, comprising: (a) a first impedance matching circuit (Monma,

Figs.8-12); and (b) a first switch capable of selectively connecting in parallel the first impedance matching circuits with a first antenna (Monma, Figs.8-12).

Regarding Claim 27, Johnston as modified by Monma teaches the parallel tuning circuit of claim 26, further comprising (c) a second impedance matching circuit (Johnston, Col.4, Lines 7-11); and (d) a second switch capable of selectively connecting in parallel the second impedance matching circuits with a second antenna (Johnston, Col.4, Lines 7-11).

Regarding Claim 28, Johnston as modified by Monma teaches the parallel tuning circuit of claim 26, wherein the first impedance matching circuit is capable of matching an impedance of a second antenna (Johnston, Col.4, Lines 7-11).

Regarding Claim 29, Johnston as modified by Monma teaches the parallel tuning circuit of claim 26, wherein the first impedance matching circuit is capable of matching an impedance in multiple frequency bands (Johnston, Col.10, Lines 4-14).

Regarding Claim 30, Johnston as modified by Monma teaches the parallel tuning circuit of claim 26, wherein the first impedance matching circuit includes a selectable impedance (Monma, Figs.8-12).

Regarding Claim 31, Johnston as modified by Monma teaches the parallel tuning circuit of claim 30, wherein the selectable impedance is digitally selectable (Monma, Figs.8-12).

3. Claims 32-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Johnston in view of Monma and further in view of Michaels et al. (U.S. Patent 4,549,312).

Regarding Claim 32, Johnston as modified by Monma teaches the parallel tuning circuit of claim 30, wherein first impedance matching circuit dynamically adjusts impedance of the antenna. Johnston and Monma failed to teach that the purpose of antenna impedance adjustment is to reduce the external interference. Michaels teach that the antenna impedance adjustment is based on external interference (Michaels, Col.1, Lines 36-44). Therefore, it would have been obvious to one of ordinary skill in the art to combine the teaching of interference cancellation of Michaels to that of the multiple antenna system of Johnston and Monma to extend the application of antenna tuning and matching to also include the interference cancellation by using the same techniques taught by Johnston and Monma.

Regarding Claim 33, Johnston and Monma as modified by Michaels teach a method of adjusting impedance in a multiple antenna system, comprising: (a) detecting a first operational state of a first signal source connected with a first antenna via

a first signal path (Michaels, Col.1, Lines 36-44, the center frequency of the receiver); (b) detecting a second operational state of a second signal source (Michaels, Col.1, Lines 36-44, the presence of the undesired narrow band signals), the second signal source being connected with a second antenna via a second signal path, the second antenna being located near the first antenna; and (c) selectively connecting a parallel impedance circuit with the first signal path based on the first and second operational states (Michaels, Col.1, Lines 36-44, varies the center frequency).

Regarding Claim 34, Johnston and Monma as modified by Michaels teach the method of claim 33, further comprising: (d) measuring external interference near the first antenna (Michaels, Col.1, Lines 64-68); and (e) automatically adjusting the parallel impedance circuit based on the external interference (Michaels, Col.1, Lines 64-68).

Regarding Claim 35, Johnston and Monma as modified by Michaels teach the method of claim 33, wherein (b) includes detecting an operational state of a third signal source (Johnston, Fig.29A), the third signal source being connected with a third antenna via a third signal path, the third antenna being located near the first antenna and (c) includes connecting a parallel impedance circuit with the first signal path based on

the first, second, and third operational states (Johnston, Col.13, Lines 32-34; Monma Figs.8-12).

Regarding Claim 36, Johnston and Monma as modified by Michaels teach the method of claim 33, wherein (c) includes selectively attaching one of a plurality of parallel impedance circuits with the first signal path (Michaels, Col.1, Lines 36-44).

Regarding Claim 37, Johnston and Monma as modified by Michaels teach the method of claim 33, further including (d) selectively attaching a second parallel impedance circuit with the second signal path (Johnston, Col.3, Lines 22 & 25 and Col.10, Lines 35-37; Michaels, Col.1, Lines 36-44).

Regarding Claim 38, Johnston and Monma as modified by Michaels teach the method of claim 33, wherein (c) includes selecting a desired parallel impedance, selecting from a plurality of parallel impedance circuits a parallel impedance circuit that most closely matches the desired parallel impedance, and attaching the selected parallel impedance circuit with the first signal path (Monma, Figs.8-12; Michaels, Col.1, Lines 36-44, varies the center frequency).

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Trikha et al. (U.S. Patent 6,072,993) teaches a portable radio operational in two frequency bands.

Nestlerode (U.S. Patent 4,701,732) teaches a fast tuning RF network.

Belcher et al. (U.S. Patent 5,589,844) teaches an automatic antenna tuner for mobile radio.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to T. Richard Lei whose telephone number is 703-305-4828. The examiner can normally be reached on 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dan Hunter can be reached on 703-308-6732. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-5403 for regular communications and 703-308-5403 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-3900.

TRL
TRL
July 18, 2002

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